(TG2) Turbulence Topical Group Report

Dec. 8, 2021 (T. Tsujimura)

Date: Dec. 7, 2021
Time: 9:50 – 18:42
Shot#: 174302 – 174463 (162 shots)

Prior wall conditioning: D_2
Divertor pump: On except for 2-I
Gas puff: D_2, Ar
Pellet: None

NBI#(1, 2, 3, 4, 5) = gas(D, D, D, D, D) = P(2.2, 1.6, 1.8, 4.0, 6.6) MW, #4A could not be operational

ECH(77 GHz) = ant(5.5-Uout (or 1.5U), 2-OUR) = P(703, 792) kW
ECH(154 GHz) = ant(2-OLL, 2-OUL , 2-OLR) = P(205, 799, 727) kW
ECH(56 GHz) = ant(1.5U) = P(-) kW
ICH(3.5U, 3.5L, 4.5U, 4.5L) = P(-, -, -, -) MW
Neutron yield integrated over the experiment = 9.2×10^{16}

Topics

1. Non-diffusive electron thermal transport during off-axis ECH (T. Tsujimura)
2. Potential and density fluctuation measurement in e-ITB to study isotope effect (M. Nishiura, A. Shimizu, T. Ido (Kyushu U.))

Non-diffusive electron thermal transport during off-axis ECH

T. Tsujimura

Experimental conditions:

(R_{ax}, B_t, γ, B_q) = (3.60 m, CW 2.75 T, 1.2538, 100.0%)

Motivation:

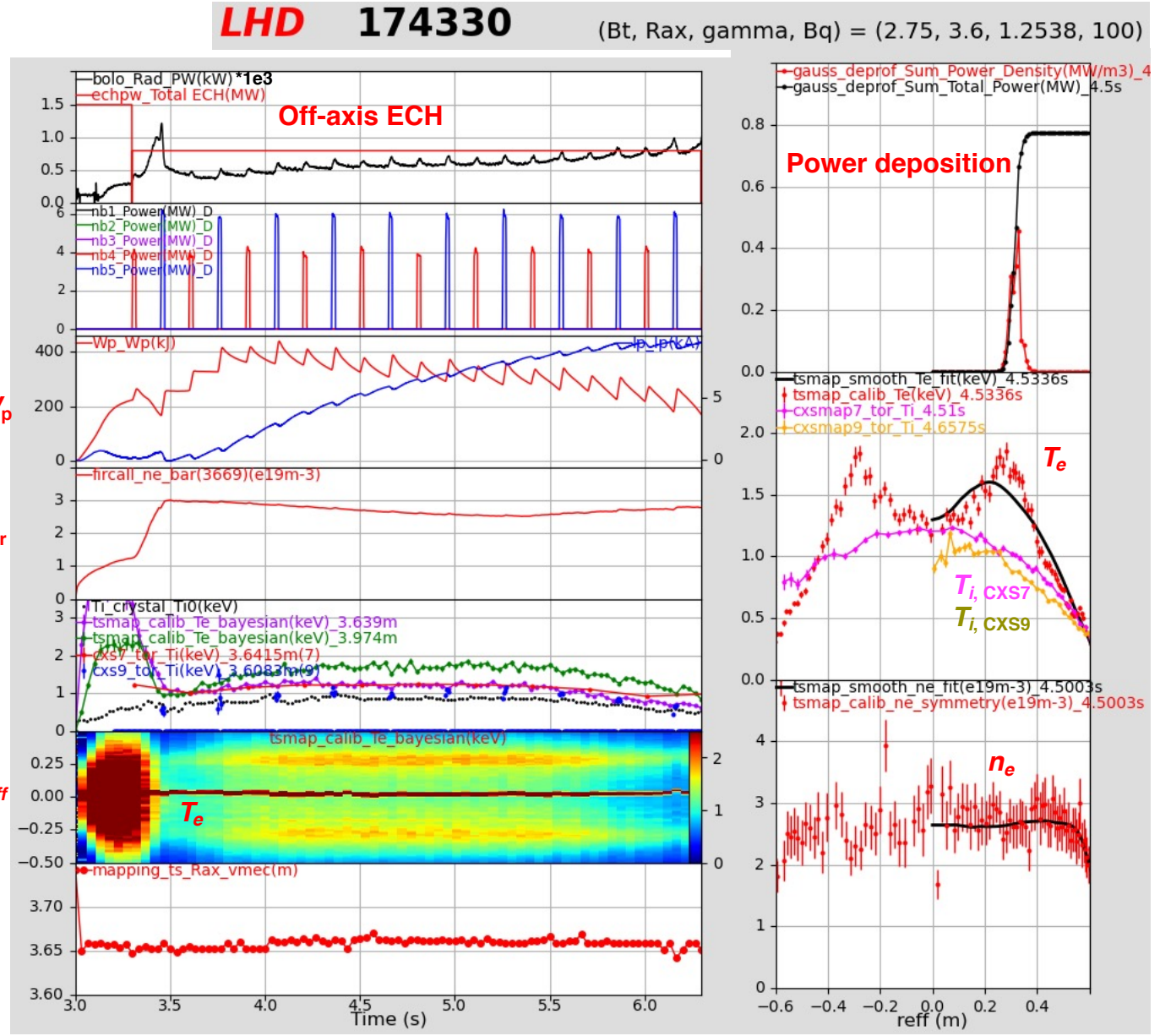
- Investigation of non-diffusive counter-gradient electron thermal transport during off-axis ECH

Experiment:

- Off-axis ECH with 0.8 MW at $r_{eff} \sim 0.3$ m
- On-axis ECH with 0.2 MW at $r_{eff} \sim 0.1$ m

Result:

- Quasi steady-state hollow T_e profiles were obtained with off-axis ECH + diagnostic p-NBI
- Sustained longer than energy confinement time
- Clear non-diffusive behavior associated with outward heat convection
- Peak T_i profiles and flat (hollow) n_e profiles
- Superimposed weak on-axis ECH caused T_e profiles to be peaked
- Quasi steady-state hollow T_e profiles could not be obtained under both on- and off-axis ECH



Non-diffusive electron thermal transport during off-axis ECH

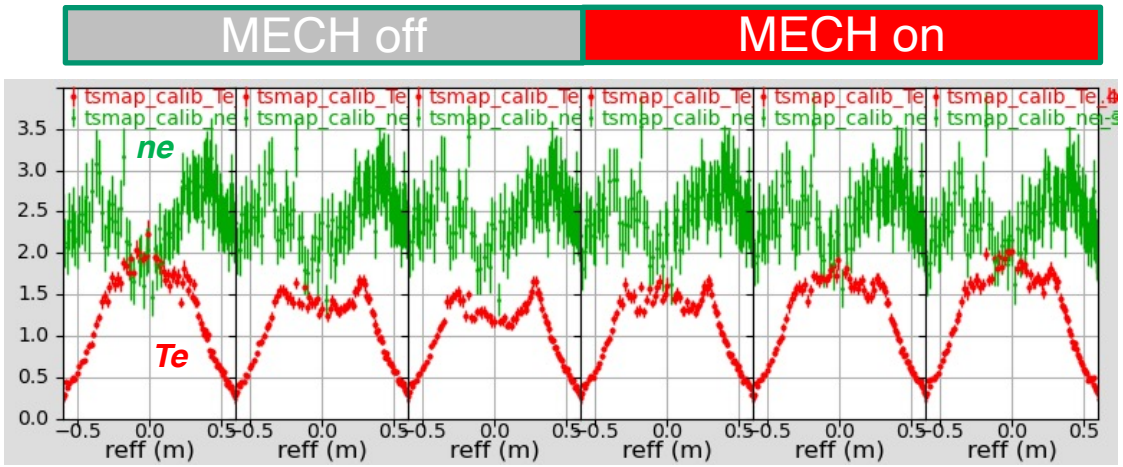
T. Tsujimura

Experiment:

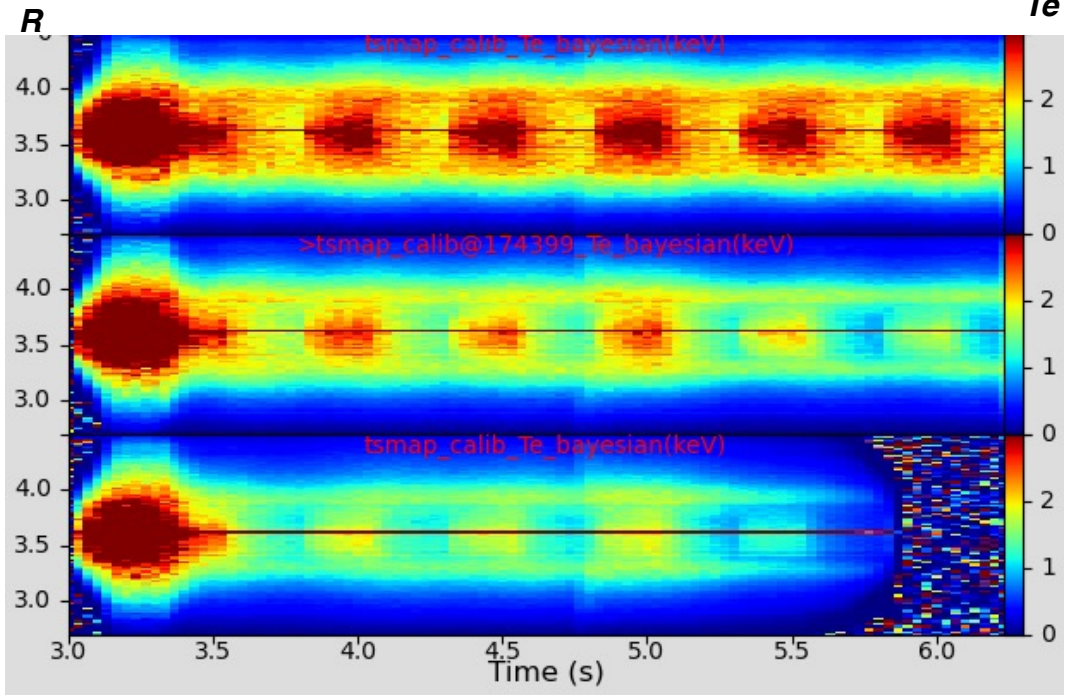
- Off-axis ECH with 0.8 MW at $r_{eff} \sim 0.3$ m
- On-axis MECH with 0.2 MW at 2 Hz at $r_{eff} \sim 0.1$ m

Result:

- T_e profiles repeatedly changed from hollow to peaked during MECH (#174400)
- ∇T_e at ~0.2 m between the two deposition radii was still positive or almost zero during MECH on
- Density scan from 1.5x to 2.8x10^{19} m^{-3}
- Hollow T_e profiles could not be obtained at < 1.7x10^{19} m^{-3}
- Power scan of off-axis ECH with one more gyrotron was not successful due to increase of gas pressure in the tube
- Non-diffusive and non-local transport properties will be investigated in dynamic transport analysis
- Turbulence measurements with PCI and scanning BS were performed, which will be analyzed in detail



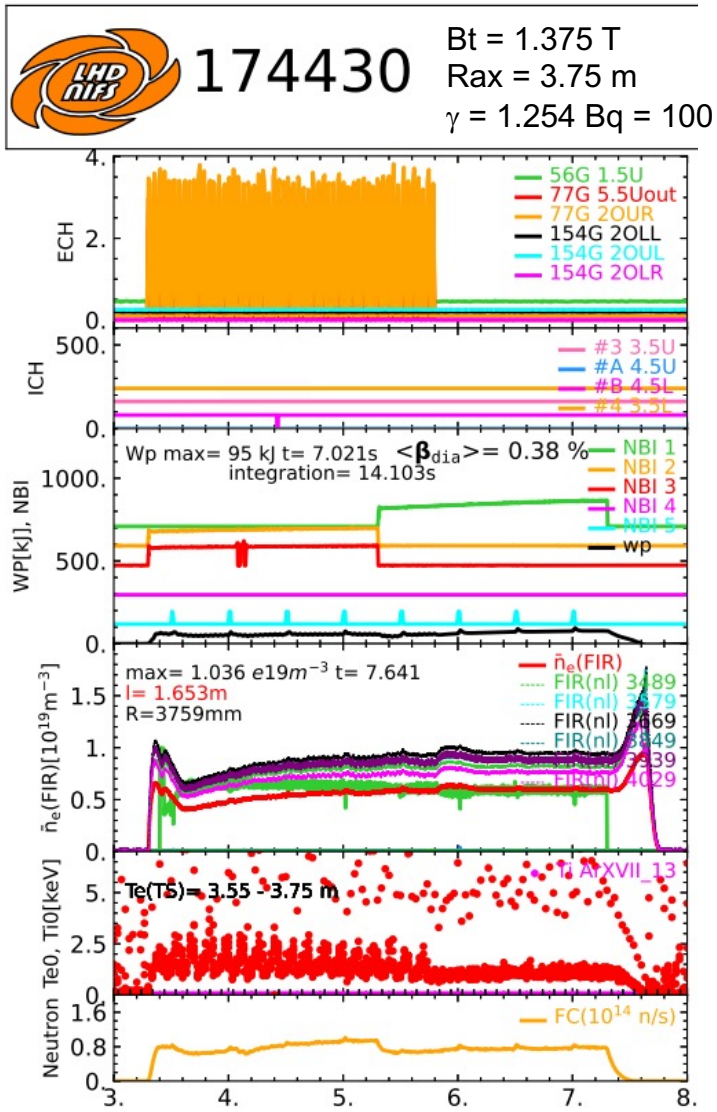
Radial profile of T_e and n_e (#174400, ~2.5x10^{19} m^{-3})



Density dependence of T_e profiles

Potential and density fluctuation measurement in e-ITB to study isotope effect

M. Nishiura, A. Shimizu, T. Ido(Kyushu Univ.) Dec. 8 2021



Experimental Condition

- #174407 - # 174446 (Rax=3.75m, Bt=1.375T, gamma=1.254, Bq=100%)
- #174447 - # 174463 (Rax=3.9m, Bt=1.375T, gamma=1.254, Bq=100%)

Background and objective

- HIBP measures a plasma potential with e-ITB to study isotope effect. The data set of D plasmas was added to obtain the dependence on the magnetic axis.

	Rax=3.6m	Rax=3.75m	Rax=3.9m
Oct 20, 2021	H	H	
Nov 16, 2021	D		
Dec 7, 2021		D	D

Results

- The potential data at electron density of 0.5×10^{19} and 0.7×10^{19} m^{-3} were obtained.
- No clear deference in potential for H and D plasmas was observed except at r/a=0.2-0.3.

2021/12/7 Rax=3.75 ne ~ 0.5 x 10^{19} m^{-3}

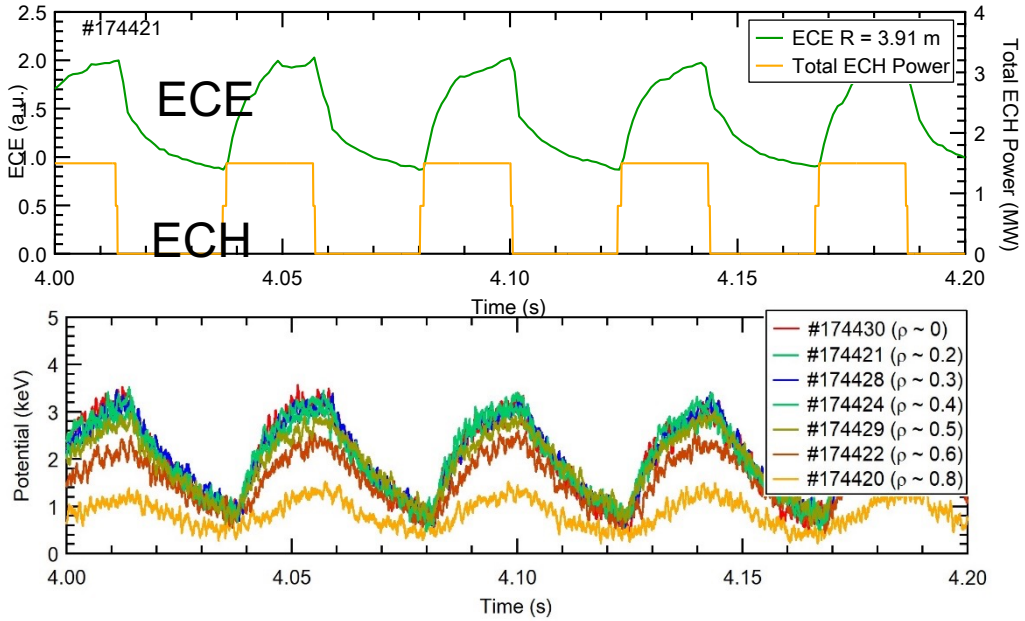
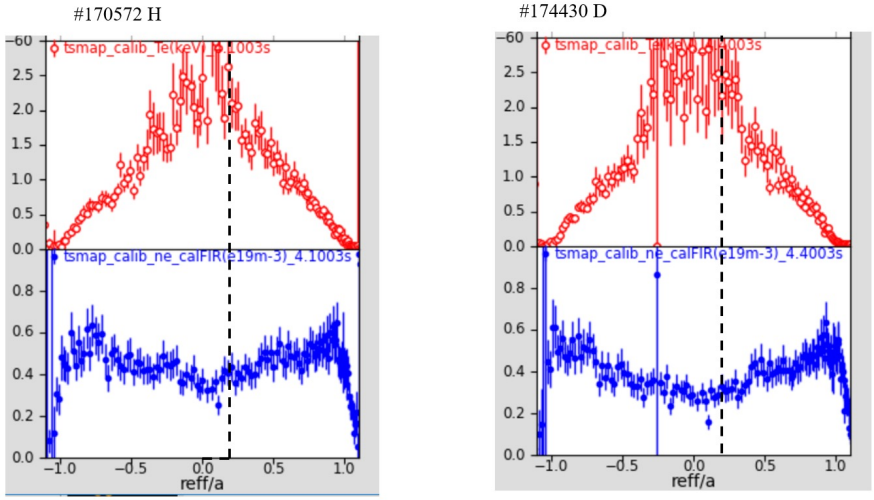
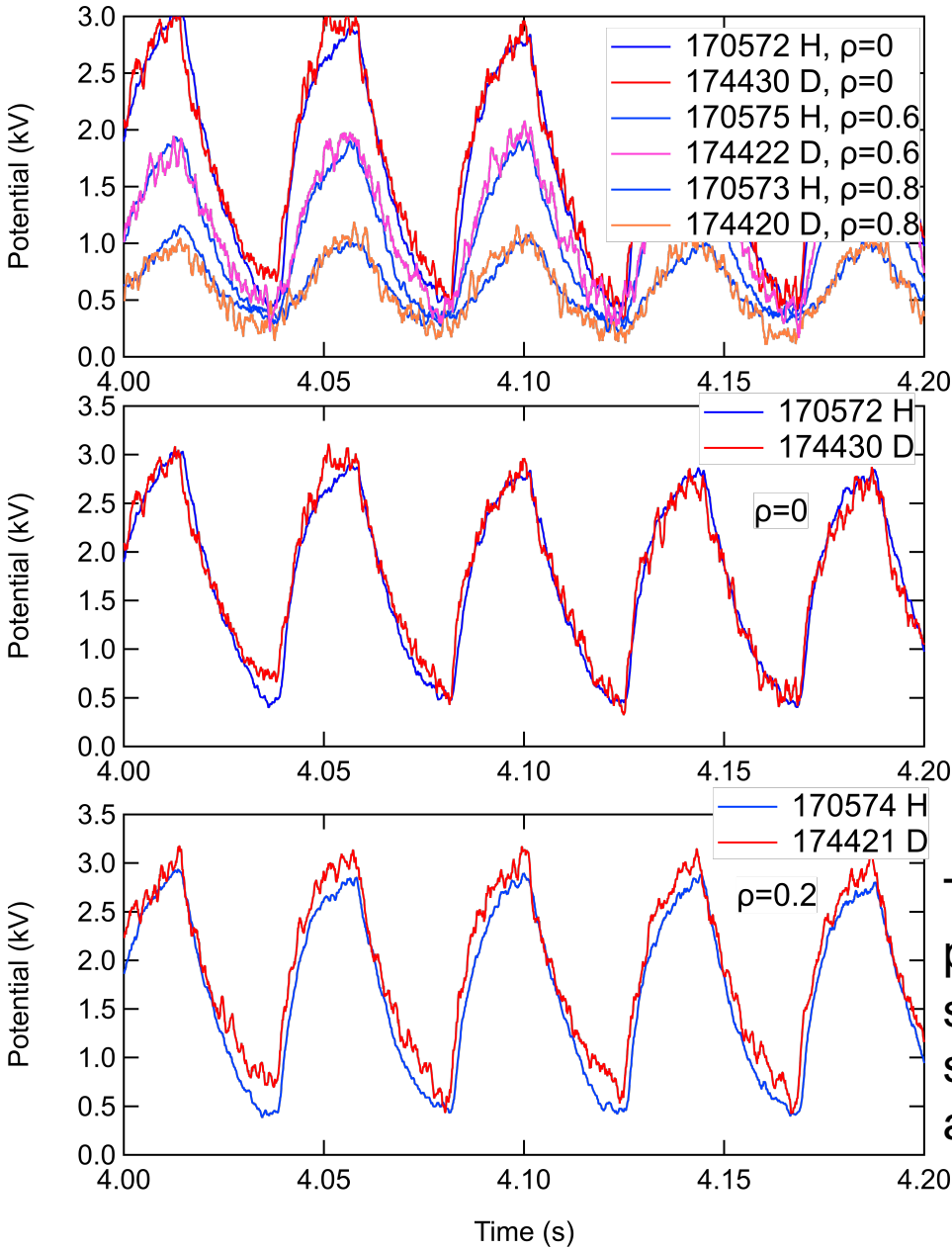


Figure. Time evolution of electron temperature(top) and plasma potential(bottom) at ρ=0-0.8 in modulated ECH.





No clear difference in plasma potential was observed at core and edge.

The potential in D plasma might be slightly higher and slower decay near an e-ITB foot.

Figure. Plasma potential formed in H plasmas(blue) and D plasmas(red).